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United States Department of Agriculture | Forest Service | RO

Reply to: 3430 Evaluation

Date: June 13, 1984

Subject: Armillaria Root Disease on the Greenhorn Ranger District, Sequoia National Forest

To:

PSW FOREST AND RANGE EXPERIMENT STATION
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The enclosed memorandum constitutes our Report No. 84-20.

ABSTRACT

A FPM plant pathologist visited several areas on the District in April. One purpose was to assess the impact of Armillaria mellea root disease in pine plantations on Breckenridge Mountain and within the Red Mountain burn. The ultimate objective was to gather information and provide alternatives for treating oaks in future timber sales, and immediately for the Munzer Sale. This root disease is seriously damaging ponderosa and Jeffrey pine plantations between 10 and 15 years of age. Alternatives for dealing with the problem are discussed, and FPM recommendations are given.

Wilfred L. Freeman Jr

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Director of Forest Pest Management

Enclosure

United States Department of Agriculture | Forest Service | RO

3430 Evaluation

Date: May 7, 1984

Armillaria Root Disease On The Greenhorn Ranger District (Report No. 84-20)

To: Forest Supervisor, Sequoia National Forest

Forest Pest Management plant pathologist, John Pronos, visited several areas on the Greenhorn Ranger District during the week of April 16, 1984. One purpose of the trip was to assess the impact of Armillaria mellea root disease in pine plantations on Breckenridge Mountain and within the Red Mountain burn. The ultimate objective was to gather information and provide alternatives that Bill Hipp can use for treating oaks in future timber sales, and most immediately for the Munzer Sale. Because the District needs this information now, we will not dwell on pest background or biologies, as much of this has been included in previous reports sent to the Forest.

This root disease is causing serious damage to ponderosa and Jeffrey pine plantations between 10 and 15 years of age. The problem is originating from the root system of oaks that were cut or killed about 15 years ago. The roots of recently killed oaks provide an ideal food base for the fungus to build up on and then spread to conifers. Normally the size and number of oaks per unit area determine, in part, how much mortality A. mellea may cause. The oaks present throughout the Greenhorn District are very large and numerous. Diameters of many oaks measured at the base were between 30 and 60 inches and commonly spaced less than 100 feet apart.

Typically the fungus has killed or is killing almost all of the pines within a 25 foot radius of each oak stump and about half of the pines between 25 and 50 feet around each stump. Our staff is not aware of any other areas in California where the Armillaria root rot situation is of this magnitude, and we are not sure how long trees will continue to be killed. Each large oak appears capable of creating an understocked area between 0.1 and 0.2 acres. All current information suggests that similar losses will occur in younger plantations or areas yet to be planted that receive the same treatment. This brings us to the question of what can be done to prevent future damage. Most of the information we have on this pathogen comes from other Regions.

The first decision to be made is whether to (1) retain the oak component and manage it, or (2) attempt to eliminate the oaks and the food base they provide. Managing the oak obviously means that oaks will continue to be present in the stands, and will require attention in any future stand entries. Living oaks provide the added benefit of acting as a barrier to dwarf mistletoe spread between pines and the underground spread of Fomes annosus from pine to pine. The fungus will also be present but not at levels that should cause significant problems. In other words the potential for Armillaria root disease problems to cause damage

will remain. On the other hand, eliminating the oak and their root systems carries with it the goal to be rid of serious potential root disease problems, at the expense of some intensive treatment. The fungus will not be eradicated but reduced to a low saprophytic state with little probability of causing future damage to the conifer stand.

Retain and manage the oak.

1. The oaks may simply be left alone or untreated, which means that the area around them will not be suitable for pine regeneration. Armillaria root disease mortalilty would be at a minimum, but nothing would be gained as far as increasing the land area in conifer production.

2. The area occupied by oak crowns can be reduced by removing large lateral branches or by thinning multiple-stemmed oaks. Root disease would be minimal, and some additional land would be available for conifers.

3. Oaks may be cut out and allowed to sprout; the objective is to manage the sprouts and in 10 to 15 years reduce their number down to a few dominant stems/parent stump. Eventually these sprouts will be trees and compete for space with pines. If oaks are overtopped by pines and die out over a long period they normally do not provide an effective food base for A. mellea. A problem seen frequently on the District is that oaks sprouts are repeatedly browsed and reduced to dozens of small shoots. This situation has little effect in reducing the potential for root disease problems. Another concern is that often old oak stumps will not sprout at all, thereby making sprout management impossible.

Eliminate the oak food base.

1. A common procedure is to cut oaks, treat stumps to prevent sprouting, and plant pine. This was the treatment done 12-15 years ago in areas where A. mellea is now killing pine saplings. We do not know how much of the oak food base has been depleted in the past 12-15 years and, therefore, cannot predict how long pine mortality will continue or say whether there will be additional root rot-caused mortality of pine seedlings interplanted now within these root disease centers. Eventually the oak food base will be gone even though the fungus will persist as a soil saprophyte. This is one method to eliminate the oak food base, but it is very damaging to regeneration attempts.

We feel that if oaks were cut and prevented from sprouting 10-20 years before any commercial pine entries, much pine mortality would be avoided. Older pines show resistance to A. mellea plus the oak root system would have decayed for 10-20 years before planting pines. The longer the interval between oak removal and pine harvesting the better.

2. A variety of techniques have been tried or tested to eliminate the food base for A. mellea. Unfortunately, for forest situations in California, these methods would have to be considered experimental and some of them impractical. Each one is expensive, and labor intensive, and the level of root disease control achieved cannot be guaranteed or predicted, even though the methods are based on the best biological information available.

Root systems that are not appreciably decayed can be mechanically removed with caterpillar tractors, backhoes, or machines designed to pull stumps out of the ground. The success of this method in preventing root disease mortality is directly proportional to the amount of root material removed; some roots will always remain. The size of oaks on the Greenhorn District would make any mechanical removal very difficult and cause considerable soil disturbance; although the soil disturbance may aid in site preparation efforts.

Researchers have eliminated this root rot fungus from infested roots by fumigating the soil with methyl bromide and carbon disulfide. These trials were done in southern California orchards and probably have little applicability to forest situations. Others have been successful in reducing disease potential by boring holes in stumps and adding fumigants. Again the questions of feasibility and effectiveness arise since none of the above procedures was ever done on root systems anywhere close to the size of oaks on the Greenhorn District.

Forest Pest Management Recommendations

Based on our perspectives of root rot biology, current forestry practices, and trends in funding, we feel that the most acceptable alternative is to harvest oaks along with conifers but allow the oaks to sprout with the intention of managing these sprouts. Repeated browsing of these sprouts will defeat the purpose of treatment as will aerial applications of herbicides for site preparation and release that are toxic to oaks. Hopefully the oak will be out-competed by the pines and eventually die out; if not, the District could kill the oak any time after the pines are 20 years old.

The second best alternative is to begin eliminating oaks from stands as far in advance of when conifers are to be cut and regenerated. Ideally, the time interval should be at least 10 years, but because of the current and continuing timber sale program this procedure will not be effective for another decade. This is not an option for current sales such as the Munzer.

It is not appropriate to select one of the above alternatives and apply it to all stands or sales on the District. Each unit should be evaluated separately for A. mellea potential and the most appropriate treatment. For example, areas that contain the most oak also present the greatest risks from Armillaria root disease, and perhaps these situations require the most aggressive and intensive treatments.

Our staff still proposes to work with the Forest, and perhaps the Pacific Southwest Station to evaluate the practicality and effectiveness of several methods to remove oak food bases. Current work commitments and schedules indicate that FY 85 would be the soonest such work could begin.

In summary, root disease problems on the Greenhorn District are serious and complex. FPM certainly intends to follow these disease situations and provide additional input whenever possible and appropriate.

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